REMARKS

Claims 1-27 are pending in the application. Claims 4, 5, 15, 16, and 24-27 have been allowed.

Claim rejections under 35 USC §102(b).

Claims 1-3, 6-14, and 21-23 stand rejected under 35 USC §103(a) as being unpatentable over Bose (5,734,112) in view of Barger (6,513,392).

As discussed below, independent claims 1 and 12 distinguish both Bose and Barger by reciting a sensor conduit that presents axes (a) and (b) in non-circular cross-section. As noted by the Examiner, Bose discloses a conduit having only circular cross-section, and Applicant maintains that Barger's expanding/constricting "tube portions" are also not indicated as being non-circular. In addition, the "tube portions" of Barger are used only for flow control, as opposed to flow measurement, per Applicant's independent claims 1 and 12, which recite "a sensor ... presenting a noncircular cross-section". Applicant's claimed invention is thus patentably distinguished over the combination of references cited by the Examiner.

Applicant believes, for at least the reasons set forth below, that the pending rejected claims are not obvious in view of the cited references.

A. <u>The Combination of Barger and Bose Distinguished</u>

The Barger patent fundamentally concerns using capacitive displacement means to make Coriolis induced phase shift measurements. Barger states that the invention provides a flow measurement technique that provides for lower flow capability, is more direct, and provides less accuracy in the circuitry than typical time based techniques. (Col. 5, line 63-66) The patent does not address the use of an elliptical or oval cross-section to optimize the measuring conduit for making precision pressure measurements.

The Barger patent refers to an integrated flow controller made by combining a Coriolis meter with a control device such as a valve or a pump. (Col. 10, lines 53-55) Adding a control element makes a mass flow controller in a more compact package and with better dynamic performance according to Barger. (Column 2, lines 34-39)

Barger has taken a Coriolis mass flow meter and coupled it to a valve or pump to make a mass flow controller in a compact package with better dynamic range. The decision to use integral or external control element(s) is made by industry experts taking in to account the fluid, system performance, serviceability, cost, and other factors. Packaging and dynamic range are only two of many factors that are considered when selecting a controller.

Referring to the Applicant's claimed invention, the pressure output shown in Figure 4, item 421, can be used to vary the speed of a pump as means to maintain constant pressure. The other outputs shown in Figure 4 (items 423 and 425) or Figure 9 (item 912) may be used to control valves, pumps or other devices. The ability to control a pump, valve, or other control element with a measured output signal in no way changes the principles of operation or the uniqueness of the claimed invention.

The above discussion of Barger does not show that it would be obvious to one skilled in the art to modify the Bose reference to include the expandable conduit taught by Barger in order to significantly improve dynamic performance (even though the resulting combination does not yield applicant's invention as claimed). Pumps and valves are commonly used in the industry in conjunction with metering devices to improve system performance. Experts familiar with fluid measurement and control would recognize that measuring devices and the control elements need to be considered separately when assessing the value of new technology or patents.

The Barger patent, initially references a valve for flow control. (Col. 11, line 37 through Col. 12, line 46) It is later expanded to include pumps. (Column 12, lines 47-49). Such a pump could be of a piezoelectric nature using

constriction or expansion to regulate fluid flow. (Col. 12, lines 53-56) Barger is referring to using a pump as the control element in this section of the patent.

Applicant's claimed invention does not share the attributes mentioned above and there is no relationship to piezoelectric pumps. A force is not applied by piezoelectric crystal or other means, there are no valves, and there is no pumping sequence. The measuring conduit is not designed to collapse or block flow. The design objective is to allow a fluid to enter the conduit with least amount of interference possible and to determine first its pressure and secondarily density, flow rate, and temperature. Unlike a pump, Applicant's claimed invention eliminates blockages that would interfere with fluid flow. There is no intent to improve pumping efficiency.

Pressure is measured by the action of the fluid on the walls of the measuring tube but Applicant's claimed invention does not create the pressure or fluid flow as is the case with a pump. Therefore, this fundamental basis of operation of Applicant's invention is essentially quite different from the operation of Barger's device, and thus Barger's use of a piezoelectric pump for a completely different purpose, cannot be reasonably characterized as analogous to Applicant's claimed invention, *which does not use a pump at all.*

Regarding the cross-sectional shape of Applicant's claimed conduit, on page 3 of the present Office Action the Examiner stated (with reference to claims 7 and 18), that "Bose … teaches the conduit is elastically deformable to change a length of the second cross-sectional axis based on pressure of the material. (Col. 2, lines 34-36).

Bose, Col. 2, lines 34-36, however, states "Changes in the pressure of the material flowing within the flow tubes *can change the stiffness* of the flowmeter's flow tubes" [emphasis supplied]. This statement does not indicate that "a length of the second cross-sectional axis" is changed *relative to the length of the first cross-sectional axis* to yield a conduit having a non-circular cross-section. Thus the Examiner's contention is not substantiated by the cited section of the Bose patent to show that Bose discloses a conduit presenting a non-circular cross-

section. To the contrary, as the Examiner states elsewhere in the present Office Action (on page 5), "Bose et al. (USPN 5,734,112) does not appear to teach the conduit presenting a noncircular cross-section".

Applicant further maintains, for reasons discussed below, that Barger also does not disclose a non-circular flow measuring conduit.

B. Additional Reasons for Allowance of Pending Claims

On page 5 of the present Office Action, the Examiner states:

> Bose et al. (USPN 5,734,112) does not appear to teach the conduit presenting a noncircular cross-section ... Barger et al. (USPN 6, 513,392) teaches the conduit presenting a noncircular cross-section of major axis (a) and minor axis (b) of respective dimensions (a) and (b) wherein the cross-section tends to become slightly more circular as pressure internal to the conduit is increased. (Col. 12, lines 53-56).

Col. 12, lines 53-56 of the Barger patent state:

> A metering pump, for example, may be used for fluid control purposes. In particular, a piezoelectric pump may be employed that includes a plurality of piezoelectric tube portions. The piezoelectric tube portions are controlled in a manner to cause different tube portions to constrict or expand, thus allowing the fluid flow to be controlled as desired.

However, in col.12, lines 48-65, Barger states:

> In alternative embodiments, a pump is used in place of the valve. **A metering pump**, for example, **may be used for fluid control purposes**. In particular, a piezoelectric pump may be employed that includes a plurality of piezoelectric tube portions. The piezoelectric tube portions are controlled in a manner to cause different tube portions to constrict or expand, thus allowing the fluid flow to be controlled as desired [emphasis supplied].

First of all, the above section in Barger cited by the Examiner does not indicate that the cross-section of the "tube portions" is non-circular. Barger merely states that the tube portions either "constrict or expand".

Furthermore, it would seem that it should be clear to one of ordinary skill in the relevant art that the use of a *pump* for "fluid control purposes" is neither

functionally nor structurally related to the (totally non-analogous) use of a non-circular tube as the Coriolis *sensor*, and thus the teaching of Barger is unrelated to Applicant's claimed (in independent claims 1 ans 12) "conduit presenting a noncircular cross-section of major axis (a) and minor axis (b) of respective dimensions (a) and (b) wherein the cross-section tends to become slightly more circular as pressure internal to the conduit is increased".

Since the "tube portions" disclosed by Barger merely "constrict or expand", there is no teaching or suggestion in Barger that the tube portions become non-circular in cross-section when constricting or expanding. Thus, Barger's use of constricting/expanding (fluid) *flow control tube portions* cannot reasonably be considered to be *structurally* analogous to Applicant's claimed non-circular *sensor* conduit. In addition, Barger's constricting/expanding "tube portions" are used only for *flow control*, as opposed to *flow measurement* (per Applicant's claimed invention), and thus are fundamentally *functionally* different from Applicant's claimed non-circular conduit, which is used as a sensor rather than as a pumping mechanism.

On page 5 of the present Office Action, the Examiner stated that "It would've been obvious ... to modify the Bose reference to include the expandable conduit taught by Barger et al. in order to [provide] significant improvement in dynamic performance. (Col. 2, lines 39-40)". Col. 2, lines 39-40 of the Barger patent state that "Such an integrated flow valve with associated sensing electronics provide a more compact package that is easier to use and provides significant improvement in dynamic performance."

However, even if the Bose device were modifiable in principle to accommodate the 'expandable conduit' of Barger, the resultant combination would still not be structurally (or functionally) similar to Applicant's claimed sensor, because the combination (as noted above):

(1) lacks any teaching or suggestion of employing a non-circular sensor conduit, and

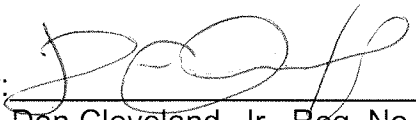
(2) fails to provide a similar function (i.e., the combination uses constricting/expanding "tube portions" for *flow control*, as opposed to *flow measurement*.)

The combination suggested by the Examiner is simply not similar to Applicant's claimed invention (as recited in independent claims 1 and 12), either in structure, or in function, and therefore such a combination cannot be used to show obviousness of either of these claims or of the claims depending therefrom. For at least the reasons enumerated above, Applicant believes that independent claims 1 and 12 are allowable over the cited art, since each of these claims recites "conduit presenting a noncircular cross-section of major axis (a) and minor axis (b) of respective dimensions (a) and (b) wherein the cross-section tends to become slightly more circular as pressure internal to the conduit is increased".

Since dependent claims 2-11 and 13-23 incorporate the limitations of the respective independent claims, these claims should also be allowable. It will be appreciated that claims 2, 13, and 14 address conduits of elliptical and oval cross-section.

Respectfully submitted,

LATHROP & GAGE L.C.

By: 

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